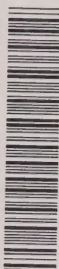


CA1  
YL16  
-1990  
B238



3 1761 11634097 7

NORAD: its history and its  
new challenges



## Background Paper

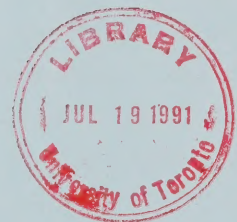
BP-238E

CA1  
yL16  
-1990  
B238

# NORAD: ITS HISTORY AND ITS NEW CHALLENGES

Michel Rossignol  
Political and Social Affairs Division

September 1990



Library of  
Parliament  
Bibliothèque  
du Parlement

## Research Branch



The Research Branch of the Library of Parliament works exclusively for Parliament, conducting research and providing information for Committees and Members of the Senate and the House of Commons. This service is extended without partisan bias in such forms as Reports, Background Papers and Issue Reviews. Research Officers in the Branch are also available for personal consultation in their respective fields of expertise.

© Minister of Supply and Services Canada 1991

Cat. No. YM32-2/238E

ISBN 0-660-13912-X

CE DOCUMENT EST AUSSI  
PUBLIÉ EN FRANÇAIS

CA1  
YL16  
-1990  
B238

## ABSTRACT

Canada's involvement in the North American Aerospace Defence Command (NORAD) has been one of the most controversial issues in post-war Canadian defence policy. The NORAD Agreement provides for the integrated operational control of Canadian and United States air defence forces, thereby ensuring a quick and effective response to any bomber attack against North America. The 1962 Cuban missile crisis and the nuclear weapons debate of the early 1960s, however, highlighted some of the implications of a bilateral operational control arrangement. Questions were also raised about continuing Canadian participation in NORAD when the bomber threat was eclipsed by that of intercontinental ballistic missiles. Nevertheless, Canada remained in NORAD and, by the end of the 1970s, began to work with the United States to prepare the modernization of air defence radars and other equipment in response to new Soviet bomber tactics and the development of the cruise missiles. The modernization measures, notably the construction of the North Warning System, generated some public debate, but the alleged links between the Strategic Defense Initiative and NORAD caused even more, until the 1986 renewal of the NORAD Agreement. Canada's interest in new air defence technologies now being studied as part of the Air Defense Initiative of the United States, notably space-based surveillance systems, could become controversial because of their implications and their costs. Though the significant reduction in East-West tensions has diminished the impetus towards the modernization of North American air defences, the gaps in radar coverage and the application of stealth technologies to bombers and cruise missiles may still have to be dealt with. Thus, while Canada will have to examine its future participation in an arrangement established in response to the Soviet bomber threat, it may well find that for security and technological reasons such participation will continue to be necessary.



Digitized by the Internet Archive  
in 2023 with funding from  
University of Toronto

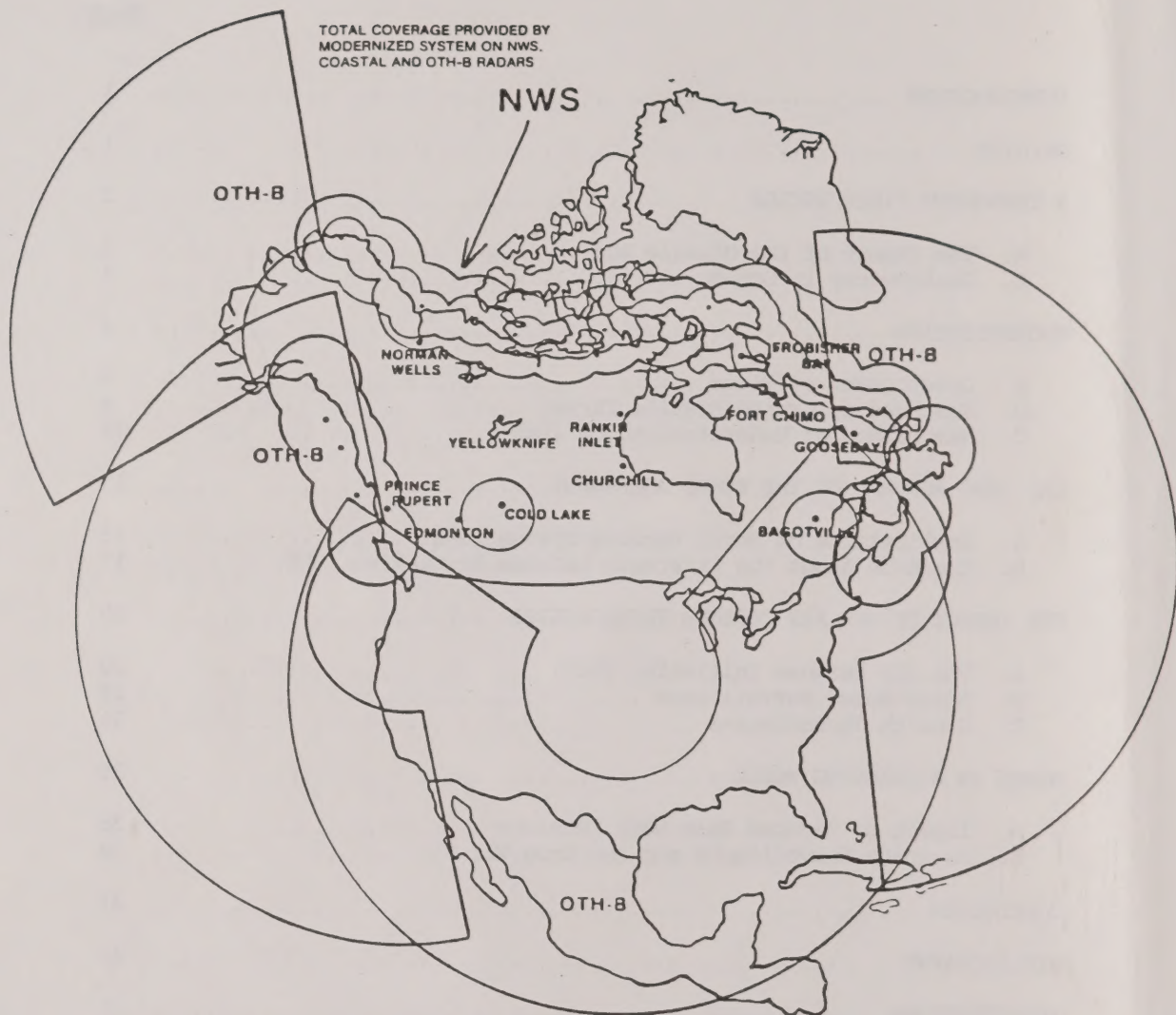
<https://archive.org/details/31761116340977>



TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION .....	1
ORIGINS .....	1
A TURBULENT FIRST DECADE .....	3
A. The Impact of the Missile Age .....	3
B. Controversy in Canada .....	4
MODERNIZATION .....	6
A. Development of Plans .....	6
B. Response to Cruise Missile Threat .....	8
C. Memorandum of Understanding of 1985 .....	12
THE 1986 RENEWAL OF THE NORAD AGREEMENT .....	13
A. Implications of North Warning System (NWS) .....	13
B. Concerns About the Strategic Defense Initiative (SDI) .....	17
THE IMPACT OF NEW AIR DEFENCE TECHNOLOGIES .....	20
A. The Air Defense Initiative (ADI) .....	20
B. Space-Based Surveillance .....	25
C. Stealth Technologies .....	31
NORAD IN A CHANGING WORLD .....	35
A. Impact of Reduced East-West Tensions .....	35
B. Airspace Surveillance and the Drug War .....	38
CONCLUSION .....	41
BIBLIOGRAPHY .....	42
ABBREVIATIONS .....	45

## NORAD's Modernized Warning System



Source: Proceedings, March 21, 1985, p. 7A:9.

*Standing Committee on External Affairs and National Defence*





LIBRARY OF PARLIAMENT  
BIBLIOTHÈQUE DU PARLEMENT

NORAD: ITS HISTORY AND ITS NEW CHALLENGES

INTRODUCTION

Recent upheavals in the Soviet Union and a significant reduction in East-West tensions have put the possible withdrawal from Western Europe of Canadian NATO forces at the centre of debate on Canadian foreign and defence policies. Canada's involvement in the North American Aerospace Defence Command (NORAD), one of the most controversial issues in post-war Canadian defence policy, may also be affected by changing perceptions of the Soviet threat as the NORAD Agreement between Canada and the United States comes up for renewal in 1991. This study examines NORAD's origins and the technological and political developments that have led to its present status and considers its future in a changing world.

ORIGINS

The Battle of Britain in 1940 demonstrated that the coordination of radar detection capabilities and interceptor forces was an essential element of air defence. However, during the Second World War, even an effective air defence system could prevent only a fraction of the wave of enemy bombers from reaching their targets. The development of the atomic bomb at the end of the war made air defence an even more porous shield and significantly increased the advantage of the attacker. Instead of large formations of bombers, only one bomber carrying an atomic bomb would be needed to wreak havoc on a city, and finding it in order to intercept it in time might prove difficult, especially in a surprise attack. Nevertheless, when the Soviet Union developed its own atomic bomb

and produced strategic bombers with sufficient range to reach targets in North America, Canada and the United States decided to bolster their individual air defence forces, and to cooperate in the construction and operation of radar lines.

Since Soviet bombers were likely to fly over the Arctic and into Canadian airspace in order to reach targets in the United States, the placement of radars as far north as possible on Canadian territory was necessary to provide adequate warning of an attack. As an ally of the United States, Canada was more than willing to cooperate, although it was well aware that a greater United States military presence in Canada might raise what a 1951 Department of External Affairs document called the "delicate problem of maintaining our autonomy."<sup>(1)</sup> In the early 1950s, Canada and the United States reached a number of cost-sharing agreements on the construction and operation in Canada of three radar lines: the Distant Early Warning (DEW) Line above the Arctic Circle, the Mid-Canada Line, and the Pinetree Line along the 49th parallel. The United States paid for the building and operation of the DEW Line; this was expensive because of the remote location. While work proceeded on the radar network, Canadian and United States military officials examined the need to coordinate the response of the interceptor squadrons.

The air forces of the two countries favoured an integrated system. Integrated operational control would allow a commander-in-chief to assess a situation based on the information received from the radar lines and to deploy Canadian and United States interceptors efficiently and rapidly. In political terms, however, such a move presented problems for Canadian sovereignty. It meant, among other things, that even in peacetime, a U.S. military officer would have operational control over Canadian interceptor squadrons. The Liberal government of Prime Minister Louis St. Laurent delayed taking a decision on the military's proposals for integrated operational control. The new Progressive Conservative government of John Diefenbaker, however, approved them shortly after taking

---

(1) Joseph Jockel, No Boundaries Upstairs: Canada, the United States, and the Origins of North American Air Defence, 1945-1958, University of British Columbia Press, Vancouver, 1987, p. 48.



power in 1957, though with at first an incomplete understanding of the political implications of the move.<sup>(2)</sup> The 1 August 1957 announcement by the Canadian Minister of National Defence and the U.S. Secretary of Defence of an agreement to integrate the operational control of air defence forces caused considerable controversy in Canada.

The Department of External Affairs expressed the view that such an important agreement required an exchange of diplomatic notes. The government became more determined to effect such an exchange when the Opposition attacked the informal nature of the agreement. Indeed, most of the controversy in Canada at this time was not over the need for a more effective air defence arrangement, which in this period of the Cold War was considered necessary, or the sovereignty implications, but rather over the manner in which the agreement had been reached.<sup>(3)</sup> The controversy continued to grow, however, when the government linked the arrangement to NATO and appeared at times to contradict itself. In the meantime, Canada and the United States exchanged diplomatic notes on 12 May 1958.<sup>(4)</sup> The integrated command structure now in place was at first named the North American Air Defence Command (NORAD) upon the suggestion of General Earl Partridge, United States Air Force (USAF), who became the first commander-in-chief of NORAD (CINCNORAD).

## A TURBULENT FIRST DECADE

### A. The Impact of the Missile Age

Ironically, Canadian and United States air defence forces came under an integrated command structure at a time when defence against bombers was rapidly declining in importance. Indeed, throughout the 1950s,

---

(2) Ibid., p. 125.

(3) Ibid., p. 117.

(4) For the text of the NORAD Agreement, see J.B. McLin, Canada's Changing Defense Policy, 1957-1963: The Problems of a Middle Power in Alliance, Johns Hopkins Press, Baltimore, 1967, p. 221-224.



there was considerable debate within the U.S. military on whether air defences should be strengthened so as to intercept as many incoming bombers as possible, or only so as to provide sufficient warning to allow the bombers of USAF's Strategic Air Command (SAC) to take off and avoid destruction on the ground. Many of the hundreds of Soviet nuclear-armed bombers that it was feared might attack North America would still have reached their targets regardless of how strong the air defences might be; therefore, the United States relied more and more on the ability of SAC bombers to carry out massive retaliation raids to deter potential aggression and depended on NORAD above all for providing warning of an attack.

The importance of interceptors declined even more in the late 1950s when rapid developments in intercontinental ballistic missile (ICBM) technology greatly diminished the possibility of Soviet bombers leading an attack against North America. The radar lines and a small force of manned and unmanned interceptors were kept to deal with any bombers supplementing attacks by ICBMs, but as the numbers and quality of the missiles deployed by the superpowers improved, air defence became more and more a minor factor in the strategic balance.

## B. Controversy in Canada

For Canada, the first years of NORAD were marked by controversy when some of the implications of a bilateral operational control arrangement became clear. In the early 1960s, while preparing to equip its air and ground NATO forces in Western Europe with nuclear weapons, Canada undertook to give such weapons to what remained of its interceptor force in Canada (CF-101 Voodoo manned interceptors and Bomarc surface-to-air missiles). This sparked one of the most heated debates in Canadian history, although the use of nuclear weapons on NORAD interceptors was for entirely different reasons from their use on NATO equipment. At the time, the U.S. Air Force considered it necessary to arm interceptors with nuclear warheads so that the nuclear bombs in any bombers shot down would be "cooked" or neutralized. As a result, the U.S. Air Force did not develop a conventional warhead for the B version of the Bomarc missile

Canada obtained.<sup>(5)</sup> This left Canada with little choice but to use nuclear weapons on the interceptors it obtained from the United States following the cancellation of the Avro Arrow program. In the eyes of some Canadians, the arming of Canadian Voodoos and Bomarc's with nuclear weapons made the NORAD Agreement even more objectionable than before. By the 1970s, Canada was no longer willing to arm its NATO and NORAD forces with nuclear weapons and terminated its commitments in this respect, but the episode left many Canadians uneasy about Canada's involvement in NORAD.

In the Cuban missile crisis of 1962, the Canadian contingent in NORAD automatically went on full alert at the same time as U.S. forces, even though the Canadian government at first considered such action unnecessary. This was a further demonstration of the degree to which Canadian air defence was entangled in the United States response to a military crisis. A similar incident occurred in 1973 when President Nixon ordered U.S. military forces to a high state of alert and Canadian personnel at NORAD Headquarters at Cheyenne Mountain near Colorado Springs, Colorado, were inevitably involved. Procedures were subsequently developed to allow U.S. personnel to replace Canadians involved in NORAD in situations where only U.S. forces went on alert.<sup>(6)</sup>

By the time the NORAD Agreement came up for its first renewal in 1968, the ever-increasing reliability and destructiveness of ICBMs left little doubt that the bomber threat was now only of secondary importance; however, as long as the Soviet Union kept some strategic bombers, a case could be made for the utility of NORAD as a warning system for surprise attacks. Amid growing doubts about NORAD's value in the missile age and continuing Canadian concerns over sovereignty and security, the agreement was renewed for five instead of ten-year periods, and a new provision was added which allowed either government to terminate the arrangement after giving one year's notice. Another new provision

---

(5) McLin (1967), p. 131-132.

(6) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 1st Session, 33rd Parliament, 14 February 1986, p. 25.

indicated that the agreement in no way implied Canadian participation in any anti-ballistic missile (ABM) defence which might be developed. This so-called ABM clause later became controversial after its omission from the agreement in 1981.

## MODERNIZATION

### A. Development of Plans

Although the predominance of ICBMs in modern warfare was recognized, the military did not wish to leave North America without some air defences. Besides, like other states, Canada and the United States wanted to retain the means to monitor and control their respective airspace. However, as the technology used in the DEW and other radar lines became more and more dated, there was increasing concern within military circles about NORAD's ability to protect sovereignty, and to deal with new developments in bomber design and tactics. By flying low over the ground, enemy bombers could evade radar detection and make surprise attacks on key elements of the U.S. nuclear deterrence force in conjunction with a missile attack. In the late 1960s, though not everyone was convinced that bombers still had a role to play in nuclear war, the U.S. military prepared for air defence modernization.

The main elements of the proposed modernization were the installation of Over-the-Horizon-Backscatter (OTH-B) radars, the use of E-3 Airborne Warning and Control System (AWACS) aircraft, the replacement of old interceptors with new ones and the integration of civilian and military radar systems in the United States to form the Joint Surveillance System (JSS). The OTH-B radars were designed to provide early warning of an attack. High frequency radar transmissions can be bounced off the earth's ionosphere; they cover greater distances than ordinary radar signals and allow the detection of aircraft hundreds of kilometres away. Once intruders are detected, AWACS aircraft carrying a sophisticated radar can track their flightpaths and control the interceptors racing to meet them. One of the main features of airborne radar platforms is their ability to



spot aircraft flying low under the signals of ground-based radars to avoid detection. However, AWACS was developed to meet the requirements of NATO's central front in Western Europe and other theatres of operations as well as to fill gaps in NORAD's radar network. Indeed, air defence modernization was but one of many U.S. defence priorities, and it was evident that the plans would be acted upon only over a period of many years.

As indicated in the 1971 White Paper on Defence, Defence in the 70s, the Canadian government viewed with interest proposals to modernize air defences.<sup>(7)</sup> It was recognized that these would ensure effective surveillance of Canadian airspace and would thus help Canada protect its sovereignty. However, the proposals also created problems for sovereignty, since, in order to deal with attacking bombers entering North American airspace, U.S. AWACS aircraft would have to fly over Canadian territory. The United States might therefore have more knowledge than Canada of what was going on in Canadian airspace. Thus, while the United States developed new radars, the Canadian government began to examine what role Canada might play in their deployment.

Shortly after the publication of the White Paper, the Canadian government undertook a thorough review of air defence policy and considered the integration of civilian and military radar networks in Canada as the United States had done in creating its Joint Surveillance System (JSS).<sup>(8)</sup> No decision was taken on the latter, but in 1975, Canada agreed with the United States to change the boundaries of NORAD regions in order to create two regions in Canada and four in the United States, in addition to one in Alaska; each would have a Regional Operational Control Centre (ROCC). The rearranged boundaries enhanced Canadian sovereignty because regions no longer straddled the Canada-U.S. border; as a result,

---

(7) Canada, Department of National Defence, Defence in the 70s, Information Canada, Ottawa, 1971, p. 7.

(8) See, for example, Major-General N. Magnusson, "Surveillance and Control of Canadian Airspace," Canadian Defence Quarterly, Vol. 3, No. 1, Summer 1973, p. 6-14.

Canadian airspace would now be controlled only by ROCCs on Canadian soil.(9)

#### B. Response to Cruise Missile Threat

In the meantime, tests confirmed that the effectiveness of OTH-B radars in the Arctic would be reduced by the effects of the Aurora Borealis on the ionosphere. Thus, instead of building in the Canadian Arctic an OTH-B installation like those proposed for the east and west coasts of North America, military planners began to consider replacing the DEW Line with a new radar line equipped with more modern radars. The Joint United States-Canada Air Defence Study undertaken in 1979 pointed out that the alternative to modernizing would be to let the existing air defence system continue to deteriorate until very costly satellite surveillance technology was ready some time in the future.(10) When the Reagan Administration came into office in January 1981, air defence received a higher priority and the proposals to modernize the existing system won more support.

After Canadian-American consultations, the Air Defense Master Plan (ADMP) was approved by the U.S. Department of Defense in 1982. Canada welcomed the plan, but made suggestions with a view to sovereignty protection as well as military efficiency. Canada suggested that in order to avoid creating a radar gap on Canada's east coast, the easternmost radars of the proposed North Warning System (NWS) be in Labrador rather than in Greenland as proposed. It was also argued that Canada might need some new coastal radars to fill the gaps left by the OTH-B radars on the east and west coasts of North America. The OTH-B radars can detect aircraft up to 2,500 km away, but because of the way their signals are bounced off the ionosphere, they cannot detect anything within 700 km of

---

(9) John Anderson, "Canada and the Modernization of North American Defense," in D. Haglund and J. Sokolsky, eds., The U.S.-Canada Security Relationship: The Politics, Strategy and Technology of Defense, Westview Press, Boulder, Colorado, 1989, p. 172.

(10) Ibid., p. 175.

the transmitter. Regular land-based radars or AWACS aircraft must be used to fill this gap and to provide interceptors with data on the altitude and direction of the intruders. A decision on this problem was delayed pending further study.

However, the United States accepted Canadian proposals for Forward Operating Locations (FOLs) in northern Canada for the deployment of interceptors, and Dispersed Operating Bases (DOBs) in Canadian territory for AWACS aircraft. These proposals were made out of necessity as well as concern for Canadian sovereignty. The modernization plans made no provision for the upgrading of the Pinetree Line radars and in fact implied the closing of most of its radar stations.<sup>(11)</sup> The DEW and Mid-Canada lines had been designed only to provide warning, with the control of interceptors being left to the facilities of the Pinetree Line near the 49th parallel.<sup>(12)</sup> The closing of the Pinetree, Mid-Canada and DEW radar lines and the replacement of the latter with a new radar line near the 70th parallel with both detection and control capabilities implied a significant shift in NORAD tactics. Instead of intercepting bombers over Canadian territory just north of the United States, NORAD interceptors would now engage intruders near the Arctic Circle or far off the east and west coasts of North America.<sup>(13)</sup> These new tactics were made necessary by the development of the cruise missile.

The ever-increasing range and accuracy of cruise missiles gave new life to strategic bomber forces. Instead of having to penetrate enemy airspace all the way to their targets, bombers could reduce the chances of being intercepted and still deliver a telling blow to the enemy by launching cruise missiles with nuclear warheads from hundreds of kilometres away. Cruise missiles, smaller than bombers and thus more

---

(11) Ibid., p. 178.

(12) Colin Gray, Canadian Defence Priorities: A Question of Relevance, Clarke, Irwin and Company, Toronto, 1972, p. 76.

(13) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 1st Session, 33rd Parliament, 14 February 1986, p. 30.



difficult to detect, could destroy vital command and communications installations as a precursor or supplement to an ICBM attack. Some strategists questioned the importance attached to cruise missiles in view of the accuracy and destructiveness of ICBMs and pointed out that Soviet cruise missiles were not as technically advanced as those of the United States. Nevertheless, the military in North America still viewed the growing Soviet cruise missile arsenal with concern.

In the early 1980s, there was still considerable uncertainty as to the ability of the new radars, including AWACS, to detect low-flying cruise missiles. This highlighted the necessity of intercepting Soviet bombers above the Arctic Circle or as far off the east and west coasts as possible before they could launch such missiles.<sup>(14)</sup> As in the past, there was no guarantee that air defence forces would be able to intercept all the incoming bombers. NORAD was still chiefly valuable for providing warning of an attack rather than an impenetrable shield. However, there was no desire to give Soviet bombers the possibility of entering North American airspace and launching cruise missiles with impunity.<sup>(15)</sup>

This situation implied the maintenance of a force which could intercept intruders, identify them visually and, in a wartime situation, shoot them down. It also meant that NORAD's interceptor force would have to intercept Soviet bombers much further north than in the past when they would have waited for the attackers near the Pinetree Line. The construction of Forward Operating Locations (FOLs) in the Canadian Arctic was proposed in order to provide Canadian interceptors from more southern bases such as Cold Lake, Alberta, and Bagotville, Quebec, with northern airfields much closer to the area of interception. In times of crisis, increased numbers of interceptors, including some from the U.S., could be

---

(14) Lt. Col. Charles Tutwiler, USAF, "The United States and the Future of North American Air Defense," in D. Haglund and J. Sokolsky, eds., The U.S.-Canada Security Relationship: The Politics, Strategy and Technology of Defense, Westview Press, Boulder, Colorado, 1989, p. 192.

(15) Kenneth Schaffel, "The U.S. Air Force's Philosophy of Strategic Defense: A Historical Overview," in Stephen Cimbala, Strategic Air Defense, Scholarly Resources Inc., Wilmington, Delaware, 1989, p. 16.

deployed to the FOLs to ensure short response time. In peacetime, Canadian interceptors can use these airfields to refuel and launch themselves quickly in order to identify intruders in Canadian airspace. Since the FOLs serve both NORAD and Canadian requirements, the Canadian and U.S. governments agreed in 1986 to share equally the costs of establishing them; in most cases, this involved the upgrading of existing airstrips. (16)

The disappearance of the Pinetree, Mid-Canada and DEW lines would leave the NWS and coastal radar stations as the only military ground-based radars in Canada, apart from those at Cold Lake and Bagotville, able to track intruders and control interceptors. With the exception of the civilian air traffic control radar network in southern Canada, there would be no radar coverage north of the NWS and south of it for up to 1,800 km down to the U.S. border. Only AWACS aircraft with both detection and control capabilities would be able to provide air defence radar coverage in the large gaps north and south of the NWS.

Because of the limited range of their radars, interceptors have to rely on data from AWACS aircraft to direct them towards intruders in Canadian airspace outside the radar coverage provided by the NWS. The cost of operating AWACS aircraft make constant patrols of Canadian airspace impractical, but the establishment of DOBs in Canadian territory facilitates the deployment of NORAD's AWACS aircraft and makes it more likely that they would be available in both peacetime and wartime to track intruders flying beyond the NWS. Thus, instead of acquiring its own AWACS aircraft and carrying out expensive patrols, Canada could count on NORAD's AWACS aircraft to fill some of the gaps left by the NWS and at the same time enhance its airspace surveillance and control capabilities. It was obvious, however, that even a large fleet of AWACS aircraft would be able to cover only a fraction of Canadian territory and that only satellites could provide surveillance for the totality of Canadian airspace. As the modernization process progressed, more and more attention was being paid to the next step, space-based surveillance.

---

(16) Anderson (1989), p. 180.

### C. Memorandum of Understanding of 1985

Before seriously considering space-based radar, Canada and the United States still had to reach agreement on the modernization of ground-based radars. In 1982, the Canadian government accepted the Air Defense Master Plan as a basis for negotiations.<sup>(17)</sup> The pace of negotiations was slow, mainly because officials were busy with other issues, but agreement on the main elements of the modernization plan was reached in time for the summit meeting in Quebec City on 18 March 1985 between Prime Minister Mulroney and President Reagan. The exchange of notes and the Memorandum of Understanding signed at the summit confirmed that Canada would be responsible for managing the work on the section of the NWS within Canadian territory and would undertake the construction of the sites and related communications facilities. The United States would supply the radars.<sup>(18)</sup> In fact, most of the NWS radars, 11 of the 13 long-range radars and 36 of the 39 short-range radars were slated to be in Canadian territory. The Canadian government, mindful of past concerns over the possible impact on Canadian sovereignty of U.S. control over DEW Line radar sites in the Canadian North, had insisted on Canada's paying for and operating as much as possible the NWS sites in Canadian territory.<sup>(19)</sup> Total costs for the construction and operation of the NWS, approximately \$1.5 billion, was shared on the basis of 60% paid by the United States and 40%, about \$700 million, by Canada.

Having taken on this heavy financial burden, Canada elected to let the United States pay for all the substantial costs of developing

---

(17) Ibid.

(18) See "Exchange of Notes Constituting an Agreement Between the Government of Canada and the Government of the United States of America on the Modernization of the North American Air Defence System (with Memorandum of Understanding)," 18 March 1985, in Canada, Treaty Series, No. 8, 1985.

(19) Joel Sokolsky, "Changing Strategies, Technologies and Organization: The Continuing Debate on NORAD and the Strategic Defense Initiatives," Canadian Journal of Political Science, Vol. 19, No. 4, December 1986, p. 769.



and operating the OTH-B radars and the AWACS aircraft. However, Canada made a commitment to assign Canadian Forces personnel to OTH-B radar sites in the United States and to NORAD's AWACS aircraft in order to emphasize its partnership with the U.S. in continental air defence. In effect, Canada was allowing United States AWACS aircraft to operate in Canadian airspace to carry out NORAD duties, on the condition that Canadian personnel be members of the aircrew.<sup>(20)</sup> Thus, as in the past, contributing to North American air defence would serve "Canadian sovereignty interests by providing the means to monitor Canadian airspace and by affording Canada a role in the defence of the continent."<sup>(21)</sup> Having committed itself so strongly to the modernization of North American air defences, it would have been surprising if Canada had not renewed the NORAD Agreement in 1986 at the end of the five-year term agreed to in 1981. Nonetheless, there was considerable public debate about the implications of Canada's involvement in continental air defence prior to renewal.

## THE 1986 RENEWAL OF THE NORAD AGREEMENT

### A. Implications of North Warning System (NWS)

The announcement of the construction of the NWS and the establishment of the FOLs and DOBs in northern Canada led to questions in the House of Commons about increased military activity in the Canadian Arctic and its implications for Canadian sovereignty.<sup>(22)</sup> Concern about the impact of increased military activity in the North was also evident

---

(20) Martin Shadwick, "Canadian Air Defence," International Perspectives, March/April 1985, p. 14. See also Canada, Department of National Defence, "Beatty Praises NORAD Modernization," News Release, 18 September 1987.

(21) D.W. Middlemiss and J.J. Sokolsky, Canadian Defence: Decisions and Determinants, Harcourt Brace Jovanovich, Toronto, 1989, p. 181.

(22) See, for example, Canada, House of Commons, Debates, 19 March 1985, p. 3164, and 20 March 1985, p. 3200-3201.

during public hearings held across Canada by the Standing Committee of the House of Commons on External Affairs and National Defence, which from mid-1985 to early 1986 examined Canadian policy on defence cooperation with the United States with particular reference to NORAD. During hearings in Yellowknife, representatives of communities throughout the Canadian Arctic said that they were worried by the social impact of an increased military presence in the North as well as the effects of aircraft noise on wildlife. Although construction of most of the FOLs was still some years away, Inuit, Dene and Metis representatives called for more consultations with the Department of National Defence. In its report, the Committee recommended that the government should try to ensure that northern communities were more closely involved in planning for defence activities in the North. (23)

In subsequent years, the FOLs were sometimes erroneously linked to low-level flying training by fighter aircraft near Goose Bay, Labrador, which until 1990 was a candidate for a NATO low-flying training base. In fact, the FOLs are used mainly as forward bases where CF-18s can be deployed for interceptions in the far North at medium to high altitudes. Unlike NATO fighter-bomber pilots, who have to practise low-level flying in order to avoid radar detection and anti-aircraft fire during attacks on ground targets, CF-18 pilots practising NORAD intercepts in the North are more likely to climb to high altitudes after take-off. Thus, operations from FOLs do not have the same impact on northern communities as does low-level training over Labrador.

The location of the North Warning System and its impact on Canadian sovereignty also attracted considerable attention. During public hearings held by the parliamentary committee examining the NORAD renewal and in the months following the tabling of its report, concern was expressed that the NWS would be built in the same area as the DEW Line and would thus leave most of the Canadian Arctic Archipelago north of it without radar coverage. Brigadier General (retired) Clay Beattie, adviser

---

(23) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 14 February 1986, p. 80.

to the Town of Inuvik, suggested that the new radar line should run along the rim of the archipelago so that radar coverage would be provided at the very edge of Canadian territory.<sup>(24)</sup> In its report, the Standing Committee indicated that it had been impressed by the concerns voiced over the location of the NWS, but had decided not to recommend extending radar coverage to the Archipelago because of the costs involved and because it believed that in the short and mid term, the use of airborne surveillance platforms like AWACS would alleviate the problem. For the long term, the Committee believed that the wide-area surveillance capabilities of space-based radar would eventually remove the problem altogether.<sup>(25)</sup>

Some people would have liked to see the parliamentary committee pay more attention to this issue. One critic claimed that its failure to do so was "another classic example of Canada's penchant for segregating military concerns from overall sovereignty concerns."<sup>(26)</sup> The fact that the Canadian government had not insisted on locating the NWS and the FOLs in the Arctic Archipelago was called by some an abdication of responsibility. It was said that Canadian sovereignty was "simply sacrificed."<sup>(27)</sup> A less strident note was sounded in March 1988, when a working group of the Ottawa branch of the Canadian Institute of International Affairs made public a report which called for the addition of radars along the outer limit of the Arctic Archipelago in order to move intercepts farther north and to monitor civilian air traffic in the Arctic.<sup>(28)</sup> However, while it may be true that a more northerly NWS could

---

(24) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Minutes of Proceedings and Evidence, 17 September 1985, p. 28:36-8. See also C. Beattie and K.R. Greenaway, "Opening Up Canada's North," Northern Perspectives, Vol. 14, No. 4, September 1986.

(25) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 14 February 1986, p. 80.

(26) John Honderich, Arctic Imperative: Is Canada Losing the North? University of Toronto Press, Toronto, 1987, p. 110.

(27) Ibid.

(28) Canadian Institute of International Affairs, National Capital Branch Working Group, The North and Canada's International Relations, Canadian Arctic Resources Committee, Ottawa, 1988, p. 61.



provide more warning and could facilitate interceptions further away from the highly populated areas of North America, Canadian and U.S. military planners had to take other factors into consideration.

For example, the fact that an infrastructure for the maintenance and supply of DEW Line radar sites was already in place militated against locating the NWS north of the existing DEW Line sites (as did the fact that the construction of new radar sites in the Arctic Archipelago would be costly because of greater distances for supply routes and difficult weather conditions). The need to ensure reliable communications between the radar line in the Arctic and NORAD Regional Operations Control Centres (ROCCs) in North Bay and the U.S. was also a factor, as was the distance NORAD interceptors would have to travel from their bases at Cold Lake and Bagotville or in the U.S. to the FOLs near the NWS. Besides, AWACS aircraft could provide radar coverage of areas north of the NWS, albeit not on a constant basis because of the high operational costs of the aircraft.

Whether or not Canadian sovereignty should have been taken more into account in the decision on the location of the NWS is debatable. As noted above, Canada had already suggested the more important change of having the radar line run down Canada's east coast instead of into Greenland, where it would have created a great radar gap between the Arctic Circle and the Maritime Provinces. To have suggested another more costly change so that the NWS would run along the outer edge of the Arctic Archipelago might have complicated negotiations with U.S. representatives and delayed construction. Furthermore, Canada was determined to pay for and to take charge of the construction and operation of the section of the NWS within Canadian territory. The high costs involved in building and operating radar sites at the outer edge of the Archipelago might have made the financial burden so onerous that this would have been impossible.

Thus, leaving a portion of the Arctic Archipelago without radar coverage was a small price for ensuring the absence of any gaps along the edge of most of Canada's territory. In any case, even if the NWS were placed at the edge of the Archipelago, a huge portion of Canadian territory between the NWS and civilian air traffic control radar coverage in southern

Canada would continue to be without any radar coverage at all, save for possible AWACS patrols. Compared to the huge gap south of the NSW, the gap north of it is quite small. In fact, compared to the DEW Line and the now defunct Mid-Canada Line, which provided only warning of an intruder's passage, the NWS, with both warning and interceptor control capabilities, will significantly improve Canada's surveillance capabilities in the Arctic and will help to assert Canadian sovereignty whatever its location.

#### B. Concerns About the Strategic Defense Initiative (SDI)

The parliamentary review of the NORAD renewal was marked by another issue which generated even more public debate: the possibility that through NORAD, Canada could become involved with the Strategic Defense Initiative (SDI), also known as "Star Wars." The announcement on 23 March 1983 by President Reagan that the United States would embark on a large-scale program to study the feasibility of developing an extensive anti-ballistic missile (ABM) defence system generated worldwide debate on whether or not such a system was possible and on the effects it would have on the nuclear arms race. Although the Canadian government had indicated on 7 September 1985 that Canada would not participate directly in SDI (though Canadian companies and universities would be free to participate in research), many Canadians told the parliamentary committee of their concerns that Canada's involvement in NORAD would lead to Canadian participation.

These fears were not allayed when in September 1985, the United States established a unified Space Command (USSPACECOM) whose Commander-in-Chief (CINCSpace) commands the U.S. Air Force's Space Command responsible for missile warning and space surveillance as well as being CINCNORAD. NORAD had already been renamed the North American Aerospace Defence Command in 1981 to reflect its involvement in both bomber and ICBM warning systems, so the establishment of space command raised suspicions about its links with NORAD. During the parliamentary hearings, some Canadian disarmament groups and academics expressed concern that the Deputy CINCNORAD and other Canadian officers within NORAD would inevitably become involved in the activities of USSPACECOM, which might eventually be

responsible for the deployment and operation of ABM systems developed under SDI and anti-satellite (ASAT) weapons developed under a separate program. Military officials and other witnesses argued that the Deputy CINCNORAD and other Canadian officers had no responsibilities in the other commands with which CINCNORAD was involved. The CINCNORAD told the Committee that "even if ballistic missile defences should ever be deployed, Deputy CINCNORAD could have no responsibilities for them unless Canada and the United States agreed to make BMD a function of NORAD."<sup>(29)</sup> Such statements, however, did not reassure Canadians who wanted a guarantee that Canada would not become involved in SDI.

There was, therefore, considerable discussion about the possible re-insertion into the text of the NORAD Agreement of the so-called ABM clause, which stated that the agreement "will not involve in any way a Canadian commitment to participate in an active ballistic missile defence."<sup>(30)</sup> Various reasons have been given for the 1981 decision to omit the ABM clause from the NORAD Agreement. On 4 February 1985, the Secretary of State for External Affairs stated in the House of Commons that the clause had been omitted because the ABM treaty between the U.S. and the Soviet Union was in place, and it was felt that a reference to ABM defence might suggest that Canada and the United States could take action to undermine it.<sup>(31)</sup> Others claimed that the re-insertion of the clause might harm Canada-U.S. relations and that it might appear that Canada

---

(29) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 14 February 1986, p. 64. On the Canadian debate on SDI during this period, see, for example, Joel Sokolsky, "Changing Strategies, Technologies and Organization: The Continuing Debate on NORAD and the Strategic Defense Initiative," Canadian Journal of Political Science, Vol. 19, No. 4, December 1986, p. 751-774; Paul Rohrlich, "Canada and Star Wars," International Perspectives, May/June 1985, p. 17-20; John Honderich (1987), p. 135-145; David Mueller, "Inescapable SDI," International Perspectives, September/October 1986, p. 14-16.

(30) NORAD Agreement (1968), p. 2.

(31) Canada, House of Commons, Debates, 4 February 1985, p. 1961.



expected the U.S. to disregard the ABM Treaty.<sup>(32)</sup> The Standing Committee took the position that ABM defences and NORAD are two separate issues, but recommended that the two countries affirm their support for the ABM Treaty at the time of the NORAD Agreement's renewal.<sup>(33)</sup>

According to its report, the Committee had more difficulty reaching a consensus on the impact of SDI. A majority of the members agreed with the Canadian government's position that it was prudent for the United States to undertake SDI-related research, while others had misgivings about every aspect of SDI and any hint of Canadian involvement. The divisions in the Committee reflected those within Canadian society. Some supported the U.S. initiative to investigate ABM defence technology while the East-West arms race continued and feared that decisions affecting Canadian sovereignty and other interests might be taken without any Canadian input unless Canada was involved in SDI. Others wanted Canada to avoid any action which might directly or indirectly link it to SDI.

Opponents of SDI viewed with suspicion the U.S. invitation to Canada to participate in a conceptual planning exercise known as Strategic Defense Architecture 2000 (SDA 2000), Phase II, slated to investigate planning for future space and ABM defences. The SDA 2000 study was not undertaken by NORAD, but rather by the U.S. Secretary of Defense's office. Phase I of SDA 2000, which had examined future anti-bomber defences and in which Canada had participated, had begun in 1982, before the SDI announcement. The emphasis in Phase II on ABM defence, however, presented the Canadian government with a politically delicate situation. Although most of the parliamentary committee members thought that it would be better for Canada to participate rather than to have no way of making Canadian views known,<sup>(34)</sup> Canada did not accept the invitation to do

---

(32) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Minutes of Proceedings and Evidence, 19 November 1985, p. 44:8.

(33) Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 14 February 1986, p. 78.

(34) Ibid., p. 75-76.

so. This decision did not affect the NORAD Agreement, which was renewed for another five years at the March 1986 summit meeting between Prime Minister Mulroney and President Reagan.

In the wake of the March 1985 signing of the Memorandum of Understanding on the modernization of air defence systems and of the renewal in March 1986 of the NORAD Agreement, the White Paper on defence policy, Challenge and Commitment, tabled in the House of Commons on 5 June 1987, could do little but reaffirm Canada's commitment to maintain its role in NORAD. However, while confirming modernization measures, such as the construction of the NWS and the FOLs, the Canadian government in the White Paper made a commitment to increase the number of Canadian Forces personnel at OTH-B radar sites in the United States and in U.S. AWACS aircraft, to emphasize the NORAD partnership between the two countries. Such action also helps to assert Canadian sovereignty, especially when U.S. AWACS aircraft fly over Canadian territory. These statements on air defence attracted less public attention than the White Paper's proposal for the purchase of nuclear-powered submarines; nevertheless, references to the Air Defense Initiative and space-based surveillance indicated Canada's interest in activities which may generate controversy in the years to come.

## THE IMPACT OF NEW AIR DEFENCE TECHNOLOGIES

### A. The Air Defense Initiative (ADI)

While SDA 2000 received much attention during the study on the NORAD renewal, it was soon forgotten when another U.S. initiative in air defence aroused the suspicions of some Canadian opponents to SDI. On 10 July 1985, President Reagan issued National Security Decision Document NSDD-178, which called for the establishment of the Air Defense Initiative (ADI), a research effort separate from but concurrent with SDI. According to the Systems Command (Electronic Systems Division) of the U.S. Air Force, ADI "will develop surveillance, battle management/command, control and communications (BM/C3) and engagement technologies for an advanced air defense system capable of detecting, tracking, identifying and nullifying

all air-breathing threats against North America."<sup>(35)</sup> Thus, while SDI examines new ABM technologies, ADI coordinates research on new technologies for the development of radars and weapons systems to deal with bombers and cruise missiles powered by air-breathing jet engines. ADI, like SDA 2000, is not under NORAD and has its own office within the U.S. Department of Defense. It is not part of SDI, but it certainly complements it. Indeed, as the CINCNORAD, General Piotrowski, USAF, explained, "most would probably agree that it's not particularly wise to build a house with a reinforced roof and then leave the doors and windows open to intrusion."<sup>(36)</sup>

The shift in emphasis in U.S. military policy during the Reagan presidency towards defensive measures like SDI and away from reliance on offensive or retaliatory capabilities could only increase the importance of North American air defence. If SDI ever provides the United States with some kind of shield against incoming ballistic missiles, an aggressor might resort to using cruise missiles launched from bombers and submarines to attack targets such as the command and communications centre of the ABM system from under the shield and so weaken the shield and improve chances of launching a successful ICBM attack. In the eyes of ADI proponents, the United States cannot afford to leave a chink in its armour. It must supplement with effective air defences any ABM defences which SDI might produce. Not everyone is convinced of the importance of the air-breathing threat, and ADI has by no means received the same priority as SDI, as demonstrated by its much smaller research budget, but its proponents in the United States were no doubt happy to see research in

---

(35) Quoted in Daniel Hayward, The Air Defence Initiative, Canadian Centre for Arms Control and Disarmament, Ottawa, 1988, p. 2. For the 1991 fiscal year, the U.S. Administration's proposed defence budget requested U.S. \$246.9 million for ADI compared with U.S. \$149.9 million for the previous year.

(36) Quoted in Tutwiler (1989), p. 191. There have been discussions between the ADI and SDI organizations for the use by ADI of the National Test Facility (NTF), part of the SDI National Test Bed (NTB) network in the U.S., for possible joint computer simulation exercises. See J.R. Wilson, "The National Test Bed: Major Advance in Computer-Based Simulation," International Defence Review, December 1989, p. 178 (supplement).



new air defence technologies carried along by the momentum of SDI in the mid-1980s. In the wake of the adoption in 1982 of the Air Defense Master Plan, research on new air defence technologies would likely have gone ahead even without a boost from SDI, but at a much slower pace.

The close relationship between ADI and SDI led some people to think that Canadian participation in ADI would inevitably draw Canada into SDI.<sup>(37)</sup> The fact that research on space-based surveillance is being carried under both ADI and SDI suggests to some that a common satellite might eventually be used for both air defence and ABM defence systems. Any new air defence systems developed as a result of ADI research could, however, be deployed whether or not SDI systems became operational.<sup>(38)</sup> Besides, just because space surveillance could be useful for both air defence and ABM defence, it does not necessarily follow that a common satellite system will be deployed. Indeed, in the mid-1980s, there was still so much uncertainty as to what systems, if any, would be deployed as a result of ADI or SDI research that claims that the two systems would be linked could only be speculative. Because of the controversy in Canada, however, the Canadian government hesitated to make any commitment to ADI.

Nevertheless, the new air defence technologies being studied under ADI must be of interest to Canada, given its participation in NORAD and its involvement in discussions related to the 1982 Air Defense Master Plan and Phase I of SDA 2000. Some Canadian officials considered some involvement in ADI desirable since "distancing Canada from what is seen as a natural evolution of ongoing modernization efforts would deprive Canada

---

(37) A. Chikvaidze, "Military Constraints on Canadian Foreign Policy," International Affairs, No. 10, October 1989, p. 77. See also David Kattenburg, "Canada's Role in an SDI Offshoot," Globe and Mail, Toronto, 9 July 1987, p. A7.

(38) See John Morrocco, "Push For Early SDI Deployment Could Spur Air Defence Initiative," Aviation Week and Space Technology, Vol. 126, No. 5, 2 February 1987, p. 18; Paul Mann, "Defense Department Official Cites Need for Early Decision on Space-Based Radars as Part of ADI Surveillance Network," Aviation Week and Space Technology, Vol. 126, No. 15, 13 April 1987, p. 25.

of input into decisions which could affect Canadian territory and airspace."<sup>(39)</sup> The need for Canada to keep abreast of U.S. research on air defence technologies was recognized before the creation of ADI in July 1985. The Memorandum of Understanding on the modernization of the NORAD radar network signed in Quebec City on 18 March 1985 made provision for the establishment of "effective means of cooperation" between Canada and the United States in research, development and employment of advanced technologies of interest to NORAD.<sup>(40)</sup> As a result, the joint Canada-United States Aerospace Defence Advanced Technology (ADAT) Working Group was set up in 1986 and met for the first time in Ottawa in November of that year.

This Working Group, whose Canadian members are representatives from the Departments of National Defence, External Affairs and Regional Industrial Expansion (subsequently Industry, Science and Technology), proposes air defence-related research and development projects, monitors the exchange of research and development information between national agencies and reports to the Canada-U.S. Permanent Joint Board on Defence (PJBD) and the Defence Development/Defence Production Sharing Arrangement Steering Committee.<sup>(41)</sup> During the 1986-1987 meetings of the ADAT Working Group, the Canadian representatives indicated Canada's interest in space-based surveillance and its desire to participate in technical research and conceptual studies related to ADI.<sup>(42)</sup>

The Canadian government made clear its intention to be involved in ADI-related research in its White Paper on defence policy tabled in the House of Commons on 5 June 1987. This states: "We also plan to participate in research on future air defence systems in conjunction

---

(39) Hayward (1988), p. 22.

(40) Canada, Memorandum of Understanding on the Modernization of the North American Air Defence System, 18 March 1985, 2, 12-13.

(41) Tutwiler (1989), p. 197. See also Hayward (1988), p. 22.

(42) Ibid., p. 198.

with the United States Air Defense Initiative."<sup>(43)</sup> Statements to the effect that the 1987 White Paper had announced that Canada "would be participating in ADI"<sup>(44)</sup> are somewhat misleading; while it participates in research projects undertaken by the U.S. under ADI, Canada is not a full partner in ADI. Indeed, Canada has never obtained representation on the Interagency ADI Steering Committee and has only one representative at the ADI office at Houston Air Force Base (AFB) in the U.S.<sup>(45)</sup> Besides, according to representatives of the Department of External Affairs on the ADAT Working Group, Canadian industry has had difficulty in obtaining access to classified information on ADI programs.<sup>(46)</sup>

In short, ADI is more a bureaucratic attempt by the U.S. to put various research projects on new air defence technologies under one roof than a definite plan to reorganize North American air defence completely and to drag Canada into SDI. Indeed, the scope of ADI is so vast that it also includes research projects on anti-submarine warfare (ASW) technologies since sea-launched cruise missiles (SLCMs) launched by submarines off the North American coasts have become an important element of the air-breathing threat.<sup>(47)</sup> The ASW element of ADI must be of interest to Canada, whose 1987 Defence White Paper emphasized the importance of a three-ocean policy and argued for the purchase of nuclear-powered submarines to bolster Canadian ASW capabilities. Subsequent events altered these plans, but Canadian and U.S. military planners are still concerned by the threats that SLCMs and air-launched cruise missiles (ALCMs) pose to command and communications centres vital to the U.S. nuclear deterrence force.

---

(43) Canada, Department of National Defence, Challenge and Commitment: A Defence Policy for Canada, Supply and Services Canada, Ottawa, 1987, p. 56.

(44) Hayward (1988), p. 23.

(45) Information provided by Department of National Defence, February 1990.

(46) Tutwiler (1989), p. 198.

(47) Mann (1987), p. 25.



## B. Space-Based Surveillance

In case of attack, defence forces would ideally detect enemy platforms, bombers and submarines, before these could launch their cruise missiles against North American targets. However, no matter how effective defence forces might be, they would not be able to detect and destroy every platform in time, especially in a surprise attack. North American air defence must therefore be ready to deal with cruise missiles as well as with bombers. The construction of the NWS and the OTH-B radar sites will provide radar coverage on the outer edge of North America, but within this fence are huge gaps in radar coverage where bombers and cruise missiles could fly undetected. Short of constructing extensive ground-based radar networks throughout North America and maintaining constant patrols by AWACS aircraft, the only way of providing full-time surveillance of North American airspace is a space-based system which can observe the continent in its entirety.

The costs for such a system would be high, but not as high as those for the construction and operation of gigantic ground-based radar networks. For small countries like France and the United Kingdom, which are acquiring fleets of AWACS aircraft, airborne surveillance can easily fill gaps left by ground-based systems or provide complete coverage of the territory. For large countries like Canada and the United States, however, too many aircraft would be needed to provide radar coverage over most of the territory and the costs of constant AWACS patrols would be prohibitive. Thus, Canada and the United States have paid considerable attention to space-based surveillance in the course of their research on new air defence technologies.

Some of the necessary technology already exists. Special cameras and synthetic aperture radar (SAR) carried by satellites can provide images of wide areas of the earth, making it possible to monitor not only ice flows and other natural phenomena, but also ship deployments and troop movements. Canadian expertise in remote sensing technology could be used in developing a space-based surveillance system. However, the detection and tracking of aircraft and cruise missiles from space require

highly sophisticated equipment.<sup>(48)</sup> A space-based surveillance system featuring general surveillance technologies as well as aircraft and cruise missile detection and tracking capabilities could ensure effective surveillance of Canada's vast territory and long coastline, and also of its airspace. This would significantly enhance the country's capacity to assert its sovereignty.

Although it may appear to pose problems, cooperation with the United States in the deployment of a joint space-based surveillance system might be the best option for Canada and, indeed, the only way Canada could afford space-based surveillance capabilities. Even if a Canadian system was deployed, its equipment might be inferior to that used in an independent U.S. system. If the United States operated its own system over North America, U.S. authorities might have more knowledge of activities within Canada's boundaries than Canadian authorities.<sup>(49)</sup> However, if a joint venture is considered the best way to serve Canadian interests, the onus is on Canada to encourage the United States to cooperate. Contrary to past experience, where Canadian cooperation was vital to the U.S. for the construction of radar warning lines, a space-based surveillance system could be deployed without Canadian participation; with such a system, U.S. cooperation with Canada in air defence becomes more a question of choice than of necessity.<sup>(50)</sup> The Canadian government has therefore sponsored relevant scientific research to demonstrate Canadian expertise and interest in space-based surveillance capabilities.

---

(48) Hayward (1988), p. 11.

(49) See J. Sokolsky, "Changing Strategies, Technologies and Organization: The Continuing Debate on NORAD and the Strategic Defense Initiative," Canadian Journal of Political Science, Vol. 19, No. 4, December 1986, p. 772-773.

(50) John Hamre, "Continental Air Defence, United States Security Policy and Canada-United States Defence Relations," in G.R. Lindsey et al., Aerospace Defence: Canada's Future Role?, Wellesley Papers, No. 9, Canadian Institute for International Affairs, Toronto, 1985, p. 25.

Following the completion of Canadian studies concluding that a space-based system was possible, the Canadian government announced in early 1987 that \$47 million would be allocated over a five-year period for more detailed Canadian research.<sup>(51)</sup> In the 1987 White Paper on defence, the Canadian government stated that if joint Canadian and U.S. research demonstrated that a space-based surveillance system was "feasible, practical and affordable," the Department of National Defence would participate in its deployment, recognizing that it would have to devote considerable resources to this project over a 15-year period.<sup>(52)</sup> While leaving open the option of a strictly Canadian system, the White Paper left no doubt that the Canadian government was concerned about the sovereignty implications of space-based surveillance. It stated: "Decisions regarding our contribution to a joint space-based radar system, or the development of a national system, if a co-operative endeavour is not possible, will have to be taken in the course of the next 5 to 10 years. Failure to meet this challenge could mean forfeiting the responsibility for surveillance of Canadian airspace to the United States."<sup>(53)</sup>

The Canadian government's position is in keeping with a growing consensus within Canada that only a space-based system can provide effective surveillance of all of Canada's airspace and territory. A number of parliamentary committees have recommended such a system to improve air defence capabilities and to enhance Canada's ability to assert its sovereignty.<sup>(54)</sup> The Senate Committee estimated that a system

---

(51) See Paul Mann, "Canada Regards Space-Based Radar as Follow-on to North Warning System," Aviation Week and Space Technology, Vol. 127, No. 13, 28 September 1987, p. 135.

(52) Canada, Department of National Defence, Challenge and Commitment: A Defence Policy for Canada, Supply and Services Canada, Ottawa, 1987, p. 59.

(53) Ibid.

(54) Canada, Senate, Special Committee on National Defence, Canada's Territorial Air Defence, Report, 1st Session, 33rd Parliament, 1985, p. 56-57; Canada, House of Commons, Standing Committee on External Affairs and National Defence, Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement, Report, 1st Session, 33rd Parliament, 14 February 1986, p. 45-47, 79.



comprising 8 to 12 satellites could cost about \$150 million per year for the first five years and would then cost \$350 million per year for the next 10 years, but such expenditures might only provide minimum capabilities.<sup>(55)</sup> In fact, it is difficult to estimate the costs of a space-based system because the type of technology to be used and the number of capabilities remain to be determined.

In Canada, research is being carried out under the project announced in early 1987 entitled Space-Based Radar Research and Development (SBR R&D). This is one of the Major Capital Projects in the budget of the Department of National Defence. It has a total budget of \$47,576,000 and was allocated \$5,509,000 for the fiscal year 1990-1991.<sup>(56)</sup> It is separate from other Capital Projects in the National Defence budget including North American Air Defence Modernization, which covers the construction and operation of the NWS, FOLs and other elements set out in the 1985 Memorandum of Agreement, and projects involving space technology such as the Search and Rescue Satellite and the Fleet Satellite Communications System. By favouring the definition and development of technology within Canadian industry, the goal of the SBR R&D project is to place Canadian industry in a good position to participate in the production of any future operational system, while enhancing Canadian technology base capability.<sup>(57)</sup> The SBR R&D project is a preliminary step towards another project, the Space-Based Area Surveillance and Warning System (SBASWS), a proposed major Crown Project that has been entered on the Department's Capital Equipment planning list. It is a preliminary estimate of what the Department of National Defence will need to fund the proposed Canadian portion of a possible joint Canada-U.S. space-based surveillance system.<sup>(58)</sup>

---

(55) Sharon Hobson, "Canada's Space-Based Radar Project," Jane's Defence Weekly, Vol. 7, No. 6, 14 February 1987, p. 226.

(56) See Canada, Department of National Defence, 1990-91 Estimates, Part III, Expenditure Plan, Supply and Services Canada, Ottawa, 1990, p. 83.

(57) Information provided by the Department of National Defence.

(58) Ibid.

Meanwhile, the United States is pursuing its own research and development for a space-based surveillance system within the context of ADI. The U.S. Air Force is in the early stages of establishing a capital equipment project for the production and deployment of a system called the Space-Based Wide Area Surveillance System (SBWASS). The Space Systems Division of the U.S. Air Force Systems Command is carrying out the research for this project. Although the Canadian and U.S. research projects are separate, Canadian and U.S. representatives have signed a Master Data Exchange Agreement (MDEA) governing the coordination of space-based radar research and development and the exchange of information.<sup>(59)</sup>

Canadian involvement in U.S. research on space-based surveillance systems is not a new development. Canada, along with Australia and Great Britain, participated in some of the research undertaken jointly by the U.S. Defense Advanced Research Projects Agency (DARPA) and the U.S. Air Force in a project known as Teal Ruby undertaken in 1977. The aim of that project was to evaluate the use of large infrared (IR) sensors in a space-based system for the detection and tracking of aircraft. In the mid-1980s, some Canadians viewed with concern Canadian involvement in the project because of claims of possible links with SDI.<sup>(60)</sup> However, the U.S. Air Force cancelled the project in 1988, and the Teal Ruby spacecraft has never been launched into space. Since 1986, little work has been done on the spacecraft, and it has recently been put in storage. Ground tests have demonstrated that the Teal Ruby IR sensors can detect aircraft, cruise missiles and ships; the launching of the spacecraft into space was apparently deemed unnecessary.<sup>(61)</sup>

There have also been claims that a U.S. Navy satellite launched in the fall of 1989 had successfully detected and tracked Soviet Blackjack bombers and U.S. Air Force F-117A fighters, the so-called stealth

---

(59) Ibid.

(60) See Sokolsky (1986), p. 77, and Mueller (1986), p. 15.

(61) B.A. Smith, "Teal Ruby Spacecraft to be Put in Storage at Norton AFB," Aviation Week and Space Technology, Vol. 132, No. 2, 8 January 1990, p. 22-23.

fighters, using IR sensor technology.<sup>(62)</sup> The ground test results on the Teal Ruby sensors and the claimed successes of the U.S. Navy satellite may give the appearance that infrared sensors are the ideal technology for space-based surveillance, but there is still considerable uncertainty as to what technology would actually be used in any full surveillance system.

The choice appears to be between IR technology and radar, although the use of the two technologies together is also a possibility, especially if both wide-area surveillance and aircraft detection capabilities are to be provided by the same space-based surveillance system. There appears to be some support on the part of the U.S. Air Force for space-based radar using technology similar to that used in ground-based radar stations and in ships and aircraft. However, radar satellites might have to be very large because of the power required to operate them and because the antenna would have to be wide enough to produce a narrow radar beam which could localize targets hundreds of kilometres away.<sup>(63)</sup> Space-based radar satellites might be too high up and thus too far away to be able to detect smaller objects, such as cruise missiles.<sup>(64)</sup>

Recent advances in IR sensor technology allow IR satellites to be smaller than space-based radar satellites and therefore less costly and easier to deploy in a group to provide surveillance of a wide area.<sup>(65)</sup> However, as IR sensors have difficulty seeing through clouds or rain and have to be close to earth to be effective, quite a number of satellites would be required to give coverage over a certain area. (Another type of satellite could be in a higher orbit and thus cover a

---

(62) Norman Friedman, "Detecting Stealth Aircraft," Proceedings of the U.S. Naval Institute, Vol. 116/7/1049, July 1990, p. 107. See also letter in Proceedings of the U.S. Naval Institute, Vol. 116/9/1051, September 1990, p. 14.

(63) Ibid. See also Hayward (1988), p. 11.

(64) Julian Moxon, "Stealth v. Stealth," Flight International, Vol. 135, No. 4149, 28 January 1989, p. 41.

(65) Friedman (1990), p. 107.



wider area.)<sup>(66)</sup> Besides, notwithstanding the apparent success of the U.S. Navy satellite in detecting aircraft, it remains to be seen if IR sensors can detect small cruise missiles from space. Thus, despite its many disadvantages, radar still has some advantages over IR sensors: "Radar can be used in all weather conditions, operates over long distances and provides data on range and speed as well as azimuth. By contrast, infrared sensors cannot measure range or speed directly. Their performance is degraded by bad weather and humidity."<sup>(67)</sup> These and many other factors are being taken into consideration by the U.S. Wide Area Surveillance Defense Acquisition Board as it comes to a decision on the technology and capabilities of a U.S. space-based surveillance system.

Such decisions are not made any easier by the increasing use of stealth technologies in the design of aircraft and cruise missiles. Though the importance of stealth technologies may be exaggerated, space-based surveillance may not be the only element of North American air defence to be affected by the ongoing drive to make aircraft and cruise missiles more difficult to detect.

### C. Stealth Technologies

A number of techniques to make aircraft more difficult to detect were used during the Second World War. They included the dropping of strips of metal called chaff to confuse enemy radars. Prodded by Cold War tensions, scientific research to help aircraft escape detection continued at a rapid pace. Among other things, this research produced radar-absorbing material (RAM), including a special gold-coloured transparent metal coating for cockpit canopies and windscreens and special paints. One example is the paint on the electronic warfare (EW) aircraft of 414 Squadron of the Canadian Forces used to test NORAD radars; this

---

(66) Hayward (1988), p. 13.

(67) David Bond, "USAF Believes Impulse Radar Not Feasible for Detecting B-2," Aviation Week and Space Technology, Vol. 132, No. 9, 26 February 1990, p. 53.

reduces the amount of radar energy reflected back to radar stations. Since conventional microwave radars detect aircraft when their signals bounce off the latter and return to the source, the fewer the radar signals an aircraft reflects back to a radar station, the greater its chances of avoiding or delaying detection. However, RAM materials cannot absorb all of the radar signals and some radar energy will inevitably be reflected by the aircraft. The smaller the radar signature or radar cross-section (RCS) of an aircraft, the less radar energy it will reflect back to the source.

While attention is also being paid to the reduction of the RCS of existing aircraft, the really significant development in recent years has been the production of aircraft such as the F-117A fighter and B-2 bomber, specifically designed to have the smallest RCS possible, sometimes to the detriment of manoeuvrability and performance. Though their shape provides most of the stealth of these aircraft, special RAM coatings are also used.<sup>(68)</sup> The angular shape of the F-117A is carefully designed so that radar signals will be reflected away from the radar source if they are not absorbed by the RAM coating. The B-2 bomber uses a flying wing concept which avoids such conventional aircraft design features as large tail surfaces. Cruise missiles can also be shaped so as to make them more difficult to detect. For example, the design of the U.S. Air Force's new Advanced Cruise Missile (ACM) makes it more difficult to detect by radar from the front and above.

The heat generated by the jet engines and electronic equipment can also be detected by infrared (IR) sensors. Thus, the heat-generating equipment of an aircraft or cruise missile, is shielded and special thin, wide exhaust vanes are used so that the exhaust plume will be as cool as possible; parts of the airframe near the jet engine exhaust vanes are covered with special tiles to prevent them from emitting heat.

Even with all these measures, whether stealth aircraft and cruise missiles can completely avoid detection is another question. Press

---

(68) Michael Dornheim, "F-117A Provides New Freedom in Attacking Ground Targets," Aviation Week and Space Technology, Vol. 132, No. 20, 14 May 1990, p. 109. See also "Hide and Disguise: A Study in Stealth," Jane's Defence Weekly, Vol. 13, No. 11, 17 March 1990, p. 490-491.

reports and some official statements may have given the impression that stealth aircraft like the B-2 bomber can be invisible to radar, but the U.S. Air Force admits that this is not the case.<sup>(69)</sup> Stealth aircraft can still be detected by conventional radar, if only sporadically. Newer types of radars like the OTH-B radars built as part of the air defence modernization plan are apparently more capable of detecting stealth aircraft and even small airborne platforms such as cruise missiles.<sup>(70)</sup> The U.S. Air Force argues, however, that even if air defence forces can detect stealth aircraft, they would find it difficult to track them, much less intercept them.<sup>(71)</sup> Press reports have suggested that the OTH-B radar facility which Australia is constructing will be able to detect the latest stealth aircraft, but these claims are said to be the result of misinterpretation of information.<sup>(72)</sup>

A similar controversy has erupted within the United States scientific community over the possible development of entirely new types of radars using ultra-wideband (UWB) technologies such as impulse technology, which would be able to detect stealth airborne platforms. UWB radars might be able to detect aircraft with radar-absorbing material and small cruise missiles while being less susceptible to electronic countermeasures (ECM) than conventional radars.<sup>(73)</sup> However, the U.S. Air Force has pointed out that many years of development will be required to produce such a radar, and there is no guarantee that it would solve significant technological

---

(69) Bill Sweetman, "Radar 'No Serious Threat' to B-2," Jane's Defence Weekly, Vol. 13, No. 25, 23 June 1990, p. 1234.

(70) Dan Boyle, "Countering Stealth: Progress in OTH Skywave Radar," International Defense Review, Vol. 23, No. 6, June 1990, p. 712.

(71) Sweetman (1990), p. 1234.

(72) Lewis Young, "Australian Radar Does Not Detect Stealth," Armed Forces Journal International, Vol. 127, No. 12, July 1990, p. 16.

(73) William Scott, "UWB Radar Has Potential to Detect Stealth Aircraft," Aviation Week and Space Technology, Vol. 131, No. 23, 4 December 1989, p. 38-41. See also William Scott, "Defense Dept. Panel of Radar Experts to Study Ultra-Wideband Technologies," Aviation Week and Space Technology, Vol. 132, No. 13, 26 March 1990, p. 55-58.



problems with regard to the processing of returning signals and the size of the antennas. (74)

The debate on the potential of UWB radar and the capabilities of OTH radars against stealth platforms is taking place amid the controversy in the United States on the future of the multi-billion dollar B-2 bomber project. This makes it more difficult to determine the validity of the claims made for these radars and stealth aircraft. Proponents and opponents of the B-2 may exaggerate or minimize the ability of the bomber to avoid detection and the capacity of radar to detect it. It is thus difficult to assess what impact recent advances in stealth technology will have on air defence forces in general and NORAD in particular. If stealth platforms are really almost impossible to detect and track, existing conventional and OTH radars may be obsolete, and air defence forces can do nothing against stealth intruders. On the other hand, if OTH radars can detect stealth aircraft, the latter may not be of much value, unless they continue to be difficult to track and intercept. If existing radars can be improved or if new radars can be developed using UWB or other technology, air defence forces might be able to deal with stealth aircraft. This would involve extensive new ground-based radar networks, unless less costly space-based surveillance systems prove to be as capable. If the past is of any guidance, air defence forces are likely to try to counter advances in stealth technology.

Indeed, the natural response of air defence forces to a major technological advance has always been to find ways to deal with it. For example, the Soviet Union's growing emphasis on the use of cruise missiles launched far from their targets prompted greater NORAD emphasis on interception of bombers above the Arctic Circle. However, given the virtual end of the Cold War, the decisions which Canada and the United States face on how NORAD should deal with the implications of stealth technology or, in fact, with any other aspect of air defence, have taken on a new dimension.

---

(74) David Bond, "USAF Believes Impulse Radar Not Feasible for Detecting B-2," Aviation Week and Space Technology, Vol. 132, No. 9, 26 February 1990, p. 53.

## NORAD IN A CHANGING WORLD

### A. Impact of Reduced East-West Tensions

The development of new air defence surveillance capabilities and stealth technologies was spurred on by the intense technological competition between the United States and the Soviet Union for most of the Cold War. There will continue to be new developments in weapon technology if only because of the dynamics of scientific research, but now that the Cold War is to all intents and purposes over, there is much less urgency in responding to each new development. Indeed, the relaxation of East-West tensions has abruptly changed the strategic situation, forcing Western military planners to adjust. Even those in the U.S. who support the deployment of whatever ABM systems SDI research may produce, have proposed less ambitious plans than in the past. The weapons the Soviet Union could use to launch an attack against North America, including bombers and cruise missiles, are to a large extent still in place, but their numbers may be significantly reduced depending on the provisions of the arms control agreements now being negotiated. Besides, whether or not it ever had bellicose intentions, the Soviet Union clearly does not have any desire at present to engage in war with the Western powers and is in fact preoccupied with cementing increasingly cordial diplomatic and economic relations with them.

The new international situation has led to cuts in defence budgets and expectations that more cuts will follow. For North American air defence, the significant relaxation of East-West tensions implies much less stress on the improvement of air defence radars and the development of space-based surveillance capabilities. As the debate rages within U.S. military and political circles concerning which units and weapons systems should be eliminated from the U.S. military inventory in order to cut costs, expensive research and development projects such as space-based radar and new types of anti-stealth radar may be delayed or suspended. Any delay by the United States in developing and deploying a space-based surveillance system will inevitably affect Canada's hopes of participating

in such a system. Canada would still have the option of developing and deploying its own system, but the costs would be high and the Canadian government, like the U.S. government, might have difficulty convincing public opinion that improved airspace surveillance is required when the threat of a Soviet attack has so greatly diminished. In short, the deployment of a space-based air defence surveillance system is many years away, depending on whether or not it can be demonstrated that such a system will be more cost-effective than existing ground-based systems.

In the meantime, NORAD will have to rely on the surveillance system it is currently modernizing. Work on the NWS started shortly after the signing of the Canada-U.S. Memorandum of Understanding in March 1985, but in 1990, a number of elements are still not in place. While some of the 14 minimally-attended long-range radars (11 in Canada) of the NWS are already in place, the 39 unattended short-range low-level radars (36 in Canada) are behind schedule and may be in place only in 1991 or 1992. Some of the FOLs have been constructed and have already been used operationally. The new radars to be placed along Canada's coasts are scheduled to become operational around 1992. The OTH-B site in Maine is operational, but the other sites are still under construction. The communications system between radar sites, ROCCs and interceptors is being modernized while the computer system at NORAD headquarters is being improved as part of a multi-million dollar project which is many years behind schedule.

In the mid-1980s, when the Memorandum of Understanding on the modernization of air defences was signed, the antagonism between the West and the Soviet bloc was still strong and military planners viewed the modernization process as an important measure to deter a Soviet attack. The Arctic was the scene of a military buildup, especially near the Bering Sea, where more and more Soviet and U.S. forces were facing each other. The airspace around Alaska, especially over the Bering and Beaufort Seas, also saw increased activity by Soviet bombers carrying cruise missiles, thus confirming the existence of the very threat which had prompted the construction of the NWS. There was a corresponding increase in the number of intercepts carried out by NORAD fighters, including Canadian CF-18s in the Canadian identification zone. The Soviets developed a new version of



the Tu-95 Bear, the Bear H, specially designed to carry cruise missiles, and started production of a new jet bomber, the Blackjack, which could also launch cruise missile attacks. The number of bombers produced by no means threatened the predominant position of ICBMs in the Soviet arsenal, but the increasing number of training flights near the Arctic regions of North America raised tensions in the area.<sup>(75)</sup> The fact that Soviet fighters could escort Soviet bombers and thus threaten NORAD interceptors added to the tensions in the area.

The significant improvement in East-West relations in the 1988-1989 period was accompanied by reductions in the number of Soviet bomber flights off the northwestern coasts of North America. While the likelihood of war with the Soviet Union has greatly diminished, Western military and government planners have adopted a cautious attitude towards the dismantling of the Western military establishment pending confirmation that the Soviet Union will maintain its present course. Since the NORAD surveillance system helps to protect the U.S. nuclear deterrence forces, it still has a role to play in the post-Cold War transition period. Besides, modernization is now nearing completion and it would be difficult to stop it abruptly. The political and economic instability in the Soviet Union has also raised fears that there could be a change in leadership which would leave the Soviet arsenal in the hands of people antagonistic towards the West.

These concerns are reflected in the statements of senior Canadian and U.S. military officials linked to NORAD as Canada and the United States consider renewal of the NORAD Agreement in 1991. Both Major General J.D. O'Brien, Commander of the Canadian NORAD Region and General John Piotrowski, USAF, Commander-in-Chief NORAD (CINCNORAD) have argued that there is a serious asymmetry between NORAD's ability to detect an ICBM

---

(75) NORAD's role in this area is discussed at length by Craig Covault in a series of articles in Aviation Week and Space Technology: "U.S. Bolsters Alaskan Force to Deter Soviet Bombers," 9 May 1988, p. 34-55; "Alaskan F-15 Capabilities Expanded to Counter Soviet Bombers, Fighters," 16 May 1988, p. 50-57; "Alaskan AWACS Proving Vital to Soviet Bomber Intercepts," 23 May 1988, p. 34-42; "Airborne Intercepts Bolstered with New Radar Data Links," 11 July 1988, p. 111-114.

attack and its ability to provide warning of a cruise missile attack.<sup>(76)</sup> U.S. built and operated missile detection systems such as the Ballistic Missile Early Warning Systems (BMEWS) could warn NORAD if ICBMs are headed for North America, but, as indicated above, even when the NWS is completed, NORAD will have a limited ability to deal with cruise missiles should any pass through this limited radar coverage. A space-based surveillance system may be able to deal with this threat, depending on the effectiveness of the technology used. Senior military officials are perhaps highlighting NORAD's deficiencies in order to bolster the case for space-based surveillance.

#### B. Airspace Surveillance and the Drug War

In the present international context, the need for any kind of air defence surveillance may appear to be superfluous, especially to those who are expecting a peace dividend in the wake of reduced international tensions and military budget cuts. However, airspace surveillance is important for sovereignty as well as for military reasons and the need for it will likely continue. As a superpower, the United States will still be concerned about its security no matter how much the threat from one quarter or another may diminish; it will likely continue to need some kind of warning about air attacks in order to protect its deterrence forces. For the time being, no country can threaten its security with weapons as sophisticated as those of the Soviet Union, but this situation can always change.

Canada is involved in U.S. defence plans because of its geography and its long-established partnership with the U.S. in ensuring the security of North America. The common threat posed by the Soviet Union has been at the centre of Canadian and U.S. defence cooperation since the end of the Second World War. Like other Western countries, Canada and the United States are still trying to adjust their diplomatic and military

---

(76) See Major General J.D. O'Brien, Air Defence, Department of National Defence, February 1990, p. 16; James Canan, "The Big Hole in NORAD," Air Force Magazine, Vol. 72, No. 10, October 1989, p. 54.

policies in the face of the all but complete disappearance of the Cold War, and it is too early to determine exactly how cooperation in a specific domain like air defence will be affected. The fact that the NORAD Agreement becomes due for renewal in 1991 while the world is still adjusting to the new international context, complicates the issue.

Indeed, a newspaper report suggests that the Department of External Affairs is advising the Canadian government to approach the renewal of the NORAD Agreement with caution.<sup>(77)</sup> A departmental document entitled Canadian Security in a World in Transition apparently suggests that the NORAD Agreement renewal and any Canadian participation in new aerospace defence systems will be acceptable only if arms control agreements, including the ABM Treaty, are respected and if the new systems do not destabilize the nuclear balance between the superpowers. The concerns expressed in the document are similar to those much in evidence at the time of the 1986 renewal of the NORAD Agreement when the controversy over SDI was at its peak. In the present context, however, where the U.S. commitment to deploy whatever ABM systems SDI research may produce does not appear to be as strong as during the Reagan Administration and where the role, if any, Canada would be invited to play in such a system is as unclear as ever, it is debatable whether the impact of some eventual SDI-related system on the ABM Treaty and the nuclear balance should be the main issues considered by the Canadian government as it approaches the renewal of the NORAD Agreement. The real question Canada should address at this time is the extent to which it will cooperate in defence matters with the United States in the post-Cold War period; it is this which will determine if it will become involved in U.S. systems which may affect the ABM Treaty and the nuclear balance, not Canadian participation in NORAD per se. Besides, as pointed out by the parliamentary committee studying the 1986 NORAD Agreement renewal, Canada's involvement in NORAD and its role in any United States ABM system are two different issues. The same situation exists now, as the NORAD Agreement reaches the end of its latest five-year term.

---

(77) Jocelyn Coulon, "Le Canada n'entend plus signer d'accords militaires avec les USA," Le Devoir (Montreal), 17 September 1990, p. 1.



Meanwhile, both Canada and the United States will have to deal with the challenges of the near future with an air defence surveillance system which does not yet provide radar coverage for all of North America. In response to the development of long-range cruise missiles and new tactics, NORAD now has a surveillance system which puts a fence around the outer edge of North America. Except for airborne patrols by AWACS aircraft, some areas within the outer edge do not have any radar coverage.

Even where there is radar coverage, the ground-based radars used were designed mainly to detect high-flying high-speed military aircraft coming from the north. Thus, the Canadian section of the NORAD surveillance system is somewhat at a disadvantage in dealing with slow low-flying single or twin-engined aircraft used for drug smuggling. These aircraft have been entering continental airspace along the coasts from two southerly directions. Nevertheless, Canada has joined the United States in using more and more air defence resources in the war against drugs.

In discussions with U.S. officials in the summer of 1989, the Minister of National Defence indicated Canada's willingness to participate within the NORAD context in efforts to detect and monitor aircraft suspected of carrying drugs into Canada and the United States. Since the United States had bolstered its air surveillance capacity along its coasts by supplementing military systems with those of the U.S. Coast Guard and the U.S. Customs Service, there was a growing possibility that drug smugglers would try to deliver illegal drugs to the U.S. market by passing through Canada. By coordinating efforts through NORAD, Canada and the United States can count on a surveillance network which covers all of North America's coastline. All Canadian resources assigned to NORAD, including CF-18 jet fighters, have been made available for anti-smuggling tasks. Controversy has surrounded the use of high-speed aircraft like CF-18s and the two Canadair Challenger jets which were assigned to anti-smuggling surveillance in July 1990 instead of being sold as had been announced in December 1989. However, the high-speed capability of these aircraft allows them to respond quickly when a suspicious aircraft is detected and their sophisticated radar allows them to monitor the latter's movements from a distance. Small executive jets like the Challengers have

been used successfully by the U.S. Coast Guard.<sup>(78)</sup> Unless there is any significant change in the drug abuse situation, NORAD is likely to continue participating in the anti-smuggling efforts for some time to come. Indeed, any improvement in the near future in NORAD's radar system will likely concentrate on plugging whatever gaps may exist in radar coverage on North America's Atlantic and Pacific coasts.

## CONCLUSION

The drug-smuggling situation highlights the need for Canada and the United States to cooperate to ensure effective surveillance of the air approaches to North America. Whether a bilateral command and control arrangement such as provided by the NORAD Agreement is the best or only way to do this is a question Canada and the United States will have to grapple with amid a geostrategic situation quite different from that in the 1950s when NORAD was created. However, while the Soviet threat has diminished, the dangers posed by technological developments such as cruise missiles and specially designed stealth aircraft cannot be overlooked. The Soviet Union may now appear to be the only country which could launch an attack against North America with such sophisticated weapons, but there is no certainty that this will continue to be the case. Given the time necessary to develop and deploy new surveillance systems, North America's future requirements will have to be examined carefully. After over 30 years of existence, NORAD, like other military arrangements and policies, is entering a period of uncertainty; however, it may well continue to have a place in the new international context.

---

(78) See, for example, Norman Polmar, "The U.S. Coast Guard: Flying Higher and Farther," Proceedings of the U.S. Naval Institute, Vol. 115/10/1040, October 1989, p. 169-171, and "Drug Interdiction: The Air War Takes Off," market supplement in Aviation Week and Space Technology, Vol. 132, No. 6, 5 February 1990.

## BIBLIOGRAPHY

- Anderson, John. "Canada and the Modernization of North American Defense." The U.S.-Canada Security Relationship. The Politics, Strategy and Technology of Defense. D. Haglund and J. Sokolsky, eds. Westview Press, Boulder, Colorado, 1989, p. 167-183.
- Bond, David. "USAF Believes Impulse Radar Not Feasible for Detecting B-2." Aviation Week and Space Technology, Vol. 132, No. 9, 26 February 1990, p. 53.
- Boyle, Dan. "Countering Stealth. Progress in OTH Skywave Radar." International Defense Review, Vol. 23, No. 6, June 1990, p. 712-713.
- Canada, Department of National Defence. Defence in the 70s. Information Canada, Ottawa, 1971.
- Canada, Department of National Defence. Challenge and Commitment. A Defence Policy for Canada. Supply and Services Canada, Ottawa, 1987, 89 p.
- Canada, House of Commons, Standing Committee on External Affairs and National Defence. Canada-U.S. Defence Cooperation and the 1986 Renewal of the NORAD Agreement (Report). 1st Session, 33rd Parliament, 14 February 1986, 81 p.
- Canada, Senate, Special Committee on National Defence. Canada's Territorial Air Defence (Report). 1st Session, 33rd Parliament, 1985.
- Canadian Institute of International Affairs, National Capital Branch Working Group. The North and Canada's International Relations. Canadian Arctic Resources Committee, Ottawa, 1988, 71 p.
- Canan, James. "The Big Hole in NORAD." Air Force Magazine, Vol. 72, No. 10, October 1989, p. 54-59.
- Chikvaidze, A. "Military Constraints on Canadian Foreign Policy." International Affairs, No. 10, October 1989, p. 74-80.
- Coulon, Jocelyn. "Le Canada n'entend plus signer d'accords militaires avec les USA." Le Devoir (Montreal), 17 September 1990, p. 1.
- Covault, Craig. "New Soviet Bombers, Fighters Heighten Alaska's Strategic Role." Aviation Week and Space Technology, 9 May 1988, p. 43-45.
- Covault, Craig. "U.S. Bolsters Alaskan Force to Deter Soviet Bombers." Aviation Week and Space Technology, 9 May 1988, p. 34-41.
- Covault, Craig. "Alaskan F15 Capabilities Expanded to Counter Soviet Bombers, Fighters." Aviation Week and Space Technology, 16 May 1988, p. 50-55.



- Covault, Craig. "Alaskan AWACS Proving Vital to Soviet Bomber Intercepts." Aviation Week and Space Technology, 23 May 1988, p. 34-42.
- Covault, Craig. "Airborne Intercepts Bolstered With New Radar Data Links." Aviation Week and Space Technology, 11 July 1988, p. 111-118.
- Dornheim, Michael. "F-117A Provides New Freedom in Attacking Ground Targets." Aviation Week and Space Technology, Vol. 132, No. 20, 14 May 1990, 106-109.
- Friedman, Norman. "Detecting Stealth Aircraft." Proceedings of the U.S. Naval Institute, Vol. 116/7/1049, July 1990, p. 107.
- Gray, Colin. Canadian Defence Priorities: A Question of Relevance. Clarke, Irwin and Company, Toronto, 1972, 293 p.
- Hamre, John. "Continental Air Defence, United States Security Policy and Canada-United States Defence Relations." In G.R. Lindsey et al, Aerospace Defence: Canada's Future Role? Wellesley Papers, No. 9, Canadian Institute for International Affairs, Toronto, 1985.
- Hayward, Daniel. The Air Defence Initiative. Canadian Centre for Arms Control and Disarmament, Ottawa, 1988, 32 p.
- Hobson, Sharon. "Canada's Space-based Radar Project." Jane's Defence Weekly, Vol. 7, No. 6, 14 February 1987, p. 226
- Honderich, John. Arctic Imperative: Is Canada Losing the North? University of Toronto Press, Toronto, 1987, 258 p.
- Jockel, Joseph. No Boundaries Upstairs. Canada, the United States, and the Origins of North American Air Defence, 1945-1958. University of British Columbia Press, Vancouver, 1987, 160 p.
- Kattenburg, David. "Canada's Role in an SDI Offshoot." Globe and Mail (Toronto), 9 July 1987, p. A7.
- Magnusson, Major-General N. "Surveillance and Control of Canadian Airspace." Canadian Defence Quarterly, Vol. 3, No. 1, Summer 1973, p. 6-14.
- Mann, Paul. "Defense Department Official Cites Need for Early Decision on Space-based Radars as Part of ADI Surveillance Network." Aviation Week Space Technology, Vol. 126, No. 15, 13 April 1987, p. 25.
- Mann, Paul. "Canada Regards Space-based Radar as Follow-on to North Warning System." Aviation Week and Space Technology, Vol. 127, No. 13, 28 September 1987, p. 135.
- McLin, J.B. Canada's Changing Defense Policy, 1957-1963. The Problems of a Middle Power in Alliance. John Hopkins Press, Baltimore, 1967, 251 p.

- Middlemiss, D.W., and J.J. Sokolsky. Canadian Defence. Decisions and Determinants. Harcourt Brace Jovanovich, Toronto, 1989, 250 p.
- Morocco, John. "Push For Early SDI Deployment Could Spur Air Defense Initiative." Aviation Week and Space Technology, Vol. 126, No. 5, 2 February 1987, p. 18.
- Moxon, Julian. "Stealth v. Stealth," Flight International, Vol. 135, No. 4149, 28 January 1989, p. 40-42.
- Mueller, David. "Inescapable SDI." International Perspectives, September/October 1986, p. 14-16.
- O'Brien, Major General J.D. Air Defence. Department of National Defence, Ottawa, 1990, 30 p.
- Polmar, Norman. "The U.S. Coast Guard. Flying Higher and Farther." Proceedings of the U.S. Naval Institute, Vol. 115/10/1040, October 1989, p. 169-171.
- Rohrlich, Paul. "Canada and Star Wars." International Perspectives, May/June 1985, p. 17-20.
- Schaffel, Kenneth. "The U.S. Air Force's Philosophy of Strategic Defense: A Historical Overview." In Stephen Cimbala, Strategic Air Defense. Scholarly Resources Inc., Wilmington, Delaware, 1989.
- Scott, William. "UWB Radar Has Potential to Detect Stealth Aircraft." Aviation Week and Space Technology, Vol. 131, No. 23, 4 December 1989, p. 38-41.
- Scott, William. "Defense Dept. Panel of Radar Experts to Study Ultra-Wideband Technologies." Aviation Week and Space Technology, Vol. 132, No. 13, 26 March 1990, p. 55-58.
- Shadwick, Martin. "Canadian Air Defence." International Perspectives, March/April 1985, p. 22-23.
- Sokolsky, Joel. "Changing Strategies, Technologies and Organization: The Continuing Debate on NORAD and the Strategic Defense Initiative." Canadian Journal of Political Science, Vol. 19, No. 4, December 1986, p. 751-774.
- Sweetman, Bill. "Radar 'No Serious Threat' to B-2." Jane's Defence Weekly, Vol. 13, No. 25, 23 June 1990, p. 1234.
- Tutwiler, Lt. Col. (USAF) Charles. "The United States and the Future of North American Air Defense." In D. Haglund and J. Sokolsky, eds., The U.S.-Canada Security Relationship. The Politics, Strategy and Technology of Defense. Westview Press, Boulder, Colorado, 1989, p. 185-204.
- Young, Lewis. "Australian Radar Does Not Detect Stealth." Armed Forces Journal International, Vol. 127, No. 12, July 1990, p. 16.

ABBREVIATIONS

ABM	Anti-Ballistic Missile
ADAT	Aerospace Defence Advanced Technology
ADI	Air Defense Initiative
ADMP	Air Defense Master Plan
ALCM	Air-Launched Cruise Missiles
ASW	Anti-Submarine Warfare
AWACS	Airborne Warning and Control System
CINCNORAD	Commander-in-Chief, NORAD
DEW	Distant Early Warning
DOB	Dispersed Operating Base
FOL	Forward Operating Location
ICBM	Intercontinental Ballistic Missile
IR	Infrared
JSS	Joint Surveillance System
NATO	North Atlantic Treaty Organization
NORAD	North American Aerospace Defence Command
NWS	North Warning System
OTH-B	Over-the-Horizon-Backscatter
RAM	Radar-Absorbing Material
RCS	Radar Cross-section
ROCC	Regional Operational Control Centre
SAC	Strategic Air Command
SBASWS	Space Based Area Surveillance and Warning System
SBR R&D	Space Based Radar Research and Development
SDA	Strategic Defense Architecture
SDI	Strategic Defense Initiative
SLCM	Submarine-Launched Cruise Missile
USAF	United States Air Force
USSPACECOM	United States Space Command











# ACCOPRESS®

NO. 2507

BF - RED	BY - YELLOW
BG - BLACK	BA - TANGERINE
BD - GREY	BB - ROYAL BLUE
BU - BLUE	BX - EXECUTIVE RED
BP - GREEN	

SPECIFY NO. & COLOR CODE

ACCO CANADIAN COMPANY LTD.  
TORONTO CANADA

